as consultants. Sir Edward Frankland was the first president, and he was followed by Sir Frederick Abel; but it was during Odling's occupancy of the chair, and largely owing to his influence, that the charter was granted in 1885. Although it is vain to look in the Royal Society Catalogue of Scientific Papers for outstanding discoveries the result of experimental work under Odling's name, it should not be forgotten that he contributed several very important articles on theoretical subjects to Watts's "Dictionary," and among them one on atomic weights, in which he came very near the discovery of the periodic law now always associated with the name of Mendeléeff.

In 1872 Odling married the only daughter of Alfred Smee, F.R.S., inventor of "Smee's battery," and formerly surgeon to the Bank of England, and by her he left three sons. Mrs. Odling died about four years ago, and this loss seems to have affected her husband seriously; however, when visited in January only a few weeks before his death his mental activity seemed undiminished, and he was ready to talk of old times.
W. A. T.

THE death of MR. C. GROVER, of Rousdon, Devonshire, on February 16, removes from the list of variable star observers a notable figure. There are now thirty-five years' observations made with the same instrument (a 6·4-in. refractor by Merz and Cooke, with low-power eye-piece of 25 by Steinheil) by the same observer on the same plan, and with remarkable regularity and continuity. The first half of these observations were collected and discussed in vol. lv. of the R.A.S. Memoirs, but an equal contribution can now be added with a natural termination. This work was planned by the late Sir Cuthbert Peek, who took a personal share in its inception. Since Sir Cuthbert's death in 1900 it has been continued by his son, Sir Wilfred Peek. Mr. Grover would have been seventy-nine on March 7, and continued at his regular work until the very day preceding his death. There can seldom have been a more single-minded piece of astronomical work.

THE death of MR. JOHN CLARKE HAWKSHAW on February 12 is recorded in *Engineering* for February 18. Mr. Hawkshaw, who was eighty years of age at the time of his death, was the son of the late Sir John Hawkshaw, whose name is associated with so many important engineering works. Mr. Hawkshaw was associated with the construction of the Albert Dock, Hull, the Severn Tunnel, etc., and assisted his father in investigations with the Channel Tunnel and many other schemes. He was elected a member of the Institution of Civil Engineers in 1867, became member of council in 1889, and held the office of president in 1902–3.

IT is announced in *Science* for February 4 that MARY WATSON WHITNEY, emeritus professor of astronomy, and from 1889 to 1910 director of the observatory of Vassar College, New York State, died on January 20, aged seventy-three years.

Notes.

THE following fifteen candidates have been selected by the council of the Royal Society to be recommended for election into the society:—Dr. W. E. Agar, Dr. F. W. Aston, Prof. W. L. Bragg, Dr. W. T. Calman, Dr. A. H. Church, Prof. G. Dreyer, Prof. W. H. Eccles, Dr. J. C. G. Ledingham, Mr. C. S. Middlemiss, Prof. K. J. P. Orton, Dr. J. H. Parsons, Prof. J. C. Philip, Dr. A. A. Robb, Sir E. Tennyson D'Eyncourt, and Mr. G. Udny Yule.

THE Royal Society administers two funds, the Gore Fund and the Trevelyan Fund, which have been bequeathed to the society for the promotion of scientific research. There is a balance in hand of about 200*l*., and the president and council would be glad to consider applications for the whole or part of this balance. Applications should be sent to the Secretaries of the Royal Society, Burlington House, London, W.1, before April 15, stating the sum asked for and the way in which it is proposed to spend it, and enclosing any references or other documents the applicant may think fit.

THE combined meeting of organising committees of the Sections of the British Association, held at Burlington House on Friday last, February 25, was so helpful in many respects that it might very well become an annual event. The meeting was called to consider various suggestions as to the number and grouping of Sections, presidential addresses, and other subjects discussed in the recent correspondence in NATURE and elsewhere, and also to facilitate the arrangement of joint programmes between two or more Sections for the annual assembly at Edinburgh in September next. At the general session it was agreed that the number of Sections should not be reduced, but that voluntary grouping for the consideration of subjects of common interest was desirable. The council (through the general officers) was empowered to fix hours of addresses and discussions, and the view was approved that the oral delivery of presidential addresses should be optional, as well as that the addresses themselves might be used to open discussions. It was also decided that the council should invite the recorders of Sections, or their nominees, to be present at meetings of council when presidents of Sections are elected. Organising committees will thus, through their representatives, be able to put forward their views as to new sectional presidents. Several important joint discussions were arranged for the forthcoming meeting, among them being one between the Sections of Physics and Chemistry on Langmuir's theory of the atom, and another between the Sections of Economics, Education, and

Psychology on vocational education and psychological tests. We hope shortly to be able to give further particulars of these and other joint discussions which promise to make the Edinburgh meeting both distinctive and of great interest to a large intellectual public.

SIR WILLIAM J. POPE has been elected Membre d'Honneur of the French Chemical Society.

THE PRINCE OF WALES has become president of the Royal Commission for the Exhibition of 1851 in succession to Prince Arthur of Connaught.

ANNOUNCEMENT is made that summer time is to begin this year during the night of April 2–3 and end on October 2–3. Last year summer time began on March 28.

THE council of the Chemical Society has awarded the Longstaff medal to Prof. J. F. Thorpe. The presentation will be made at the annual general meeting on March 17.

BY a decree dated December 17, 1920, the centesimal system of angular measurement has been adopted in Sweden for land surveying, the hundredth part of a right angle being indicated by 1°.

THE Mackenzie-Davidson memorial lecture of the Electro-Therapeutics Section of the Royal Society of Medicine will be given at 8.30 p.m. on Friday, March 18, at the rooms of the society, 1 Wimpole Street, W.1, by Prof. W. D. Halliburton, who will take as his subject "Physiological Advance: The Importance of the Infinitely Little."

THE sixth Guthrie lecture in connection with the Physical Society of London will be delivered at 5 o'clock on Friday, March 11, at the Imperial College of Science and Technology by Prof. A. A. Michelson, of Chicago. The subject will be "Some Recent Applications of Interference Methods." To this meeting visitors are invited.

A DISCUSSION on problems of seismology will be held in the rooms of the Royal Astronomical Society to-morrow, March 4, at 5 p.m. The chair will be taken by Prof. H. H. Turner. Prof. Horace Lamb will open the discussion, which will be continued by Dr. G. W. Walker, Mr. R. D. Oldham, and Mr. J. J. Shaw.

WE regret to learn that Prof. William A. Bone, professor of chemical technology at the Imperial College of Science and Technology, South Kensington, whose work on fuel is so well known, underwent a serious operation on Thursday last, and is at present passing through a critical period of recovery. He is, therefore, compelled to suspend all his scientific and public engagements for some time.

THE British Research Association for Liquid Fuels for Oil Engines Industry has been approved by the Department of Scientific and Industrial Research as complying with the conditions laid down in the Government scheme for the encouragement of industrial research. The secretary of the committee engaged in the establishment of this association is Mr. Percy Still, 19 Cadogan Gardens, S.W.1.

AT the last meeting of the Geological Society Mr. C. Carus-Wilson exhibited a specimen of stalagmite from a cave in the Cheddar district containing the preserved impressions of moths' wings. Each layer of the stalagmite shows a number of these fossils, and Mr. Carus-Wilson thinks they may have been rejected by bats while feeding. The stalagmite had formed on a ledge at one side of the cave about 60 ft. from its mouth. Many other limestone caverns might yield similar fossils if searched.

Science for February 4 announces that the John Fritz gold medal for notable scientific and industrial achievement has been awarded to Sir Robert Hadfield, inventor of manganese steel and leader of the British steel industry. The award of the medal has been authorised unanimously by the sixteen members of the committee representing the national organisations of civil, mechanical, mining, metallurgical, and electrical engineers. The medal was established in 1902 in honour of John Fritz, ironmaster of Bethlehem, Pennsylvania.

A SWEDISH expedition, under the leadership of Dr. Otto Nordenskjöld, is at present engaged in exploration in the central and southern Cordilleras of South America. The *Geographical Journal* for February states that Dr. Nordenskjöld, accompanied by Mr. A. Bäckman, Count S. de Rosen, and others, began work last autumn in the Sierra region south of Oroya and explored the little-known Perene River and Pangoa Valley. In December the expedition went south to Chile. Its destination was the Peñas Gulf and the region round San Rafael Lake. It is hoped also to ascend one of the glaciers to the inner mountain region. The expedition, which has received valuable assistance from the Governments of Peru and Chile, expects to return to Europe at the end of the southern summer.

THE *Times* for February 25 contains an interesting letter from the secretary of the China Inland Mission with regard to the great earthquake that visited the north-west provinces of China on December 16 last. The meizoseismal area covers a large portion of the provinces of Kansu and Shensi, and is not less than 200 miles long from north-west to south-east and about 150 miles wide. The centre of the area lies about 30 miles south-east of Pingliang. Even near Sichow, which is about 250 miles from the epicentre, the shock was strong enough to throw down houses and to bury the inmates in the ruins. The earthquake seems to have been a remarkable one, even among shocks of the first order of magnitude, especially as regards the great size of the area of destruction and the changes wrought in the superficial layer of the crust.

THE next summer meeting of the Institution of Electrical Engineers will be held in Scotland on June 7–10. The first two days will be spent in Glasgow, when visits will be paid to the new power station at Dalmarnock and to works and other places of interest. There will also be papers on that power station and on the hydro-electric power resources of Scotland. On

June 9 the party will proceed by special train to Fort William or Banavie (Inverness Canal), and on the following day a steamer will take the visitors down Loch Linnhe to Kinlochleven, where the hydro-electric installation of the British Aluminium Co. will be visited. In the afternoon the steamer will continue its journey southwards and land the party at Oban, where the visit will end on Friday evening, June 10. The journey to Fort William and thence to Oban will give an opportunity of seeing the most magnificent scenery of the Western Highlands.

A joint discussion on "The Failure of Metals under Internal or Prolonged Stress," to be held on April 6, is being organised by the Faraday Society, the Institution of Mechanical Engineers, the Institute of Metals, and the Iron and Steel Institute. Other institutions of engineers and shipbuilders are also participating in the discussion, which will occupy an afternoon and an evening session. The proceedings will be opened by Dr. W. Rosenhain, and the preliminary programme contains a list of sixteen papers on specific aspects of the subject, in which the chemical influences at work, the effects of stress at high temperature, corrosion, the mechanism of failure from internal stress, as well as particular points in relation to the failure of steel, brass, and lead, will be discussed. An exhibition of specimens will be held in connection with the meeting. Further information can be obtained from Mr. F. S. Spiers, secretary to the joint committee, 10 Essex Street, Strand, W.C.2.

The Electro-Therapeutic Section of the Royal Society of Medicine and the British Association of Radiology and Physiotherapy have organised a congress to be held in London on April 14–16. Sir Humphry Rolleston will be president of the meeting, and Dr. G. Harrison Orton secretary-general. The honorary secretaries for general correspondence are Dr. S. Melville and Dr. Justina Wilson, and the sectional secretaries Dr. N. S. Finzi for radiology, Dr. G. Murray Levick for electrology, and Dr. C. V. MacKay for physiotherapy. A provisional programme of the meeting has been arranged which includes discussions and visits to the electrical departments of selected London hospitals. Abstracts of papers should reach the secretaries at the Royal Society of Medicine before March 24; communications may be written either in English or in French.

The Teyler Society of Haarlem announces that a gold medal of the value of 400 florins will be offered in 1924 for a treatise dealing with the following investigations:—"Referring to the studies of V. Grégoire, which show that the nuclei of both animal and vegetable cells are built up of karyomeres, the society invites investigation into the nature of these organs, especially during the period of rest of the nuclei, and of their bearing on questions of heredity." Papers may be submitted in English, Dutch, French, or German (in Latin characters), and must be typewritten or written by someone other than the author; they become the property of the society, and the right to publish them in its Proceedings is reserved. The works should be sent under a pseudonym, and the author's name and address enclosed in a sealed envelope bearing the same pseudonym. Papers must reach the society on or before April 1, 1923, and should be addressed: aan het Fundatiehuis van wijlen den Heer P. Teyler van der Hulst, te Haarlem.

An inquiry into the present-day problems connected with the spread and prevention of filarial diseases in the tropics, more especially as they affect Demerara and the West Indies, has been undertaken at the request of the Colonial Office by the London School of Tropical Medicine. Dr. J. Anderson and his laboratory staff sailed from England on February 24; Prof. R. T. Leiper, the leader of the expedition, and the other members, Dr. Vevers, Dr. C. U. Lee, and Dr. Khalil, will proceed by different routes during March. The whole party will meet in Demerara early in April. The expedition will be away for upwards of seven months. The sending of this expedition at the present moment is particularly opportune in view of the proposed Intercolonial Medical Conference which is to be held shortly at Georgetown, British Guiana, to consider the sanitary problems of the West Indies. The expedition has been made possible through the generous public support accorded to the appeal recently made by Lord Milner on behalf of the London School of Tropical Medicine.

In a communication from the Decimal Association on the progress of the metric system of weights and measures, it is stated that since the war the system has made notable headway in many foreign countries which have not yet officially made it compulsory for use in trade. In China the system is already in exclusive use on the railways, and it is expected that the Government will adopt the metric units when standardising their weights and measures. Legislative proposals having for their object the exclusive use of the system for trade purposes are at present under consideration in the United States, Japan, and Siam. Our own Ordnance Survey Office has announced that on all small-scale maps an alternative scale of kilometres and tenths will be printed in addition to the scale of inches, and on all small-scale layer maps the metric heights will be added in whole numbers of metres. The Decimal Association urges the Government to abandon its attitude of passive permission of the metric system and to embark on a campaign of active encouragement, and adds that it appears inevitable that the metric units will ultimately become the world standards of weight and measure, and that the longer we delay its exclusive adoption the more difficult and costly will be the transition.

Sir Herbert Jackson, the retiring president of the Institute of Chemistry, in the course of his address at the annual general meeting on March 1, remarked that Government Departments and official authorities generally have shown more inclination in recent times than in the past to accord higher recognition to the services of men of science. The institute is taking part in many matters affecting the public life of the country where chemistry is concerned, and the annual report shows that chartered professional bodies of this character are able to render the State valuable service. The greater consideration given to science by the Government is an encouragement to the coming generation of chemists to follow a career of essential and vital importance to the needs of the country. Sir Herbert Jackson added that it would probably be regarded as desirable at the present moment for the council of the institute, without taking part in politics, to give expression to its views on the grave importance of maintaining in this country industries on which not only the future development of our chemical industry and many allied industries depends, but also the outlook of a very large number of students of chemistry who are now in course of training. The institute is entrusted by its charter with securing the supply of well-trained chemists, but unless a great chemical industry is maintained there will be a very poor prospect for them. Mr. A. Chaston Chapman succeeds Sir Herbert Jackson as president of the institute.

THE dry weather experienced recently is occasioning a suspicion in some quarters that the wet years we have had may be followed by a period of drought. This is naturally of importance in London and largely populated centres. It is customary now to compare rainfall results with the new normals for the thirty-five years 1881 to 1915. Taking Greenwich observations for means of comparison, the annual results for the last ten years show an excess of rain in seven years on the thirty-five years' average (23·50 in.) and a deficiency in three years. Other stations in the Thames Valley generally support these results. The total rainfall at Greenwich for the ten years was 254·25 in. Looking at the Greenwich results for the last hundred years, the heaviest rainfall in ten years seems to have occurred in 1872 to 1881, when there were seven years with an excess, and three years with a deficiency, on the hundred years' normal (24·41 in.). The total rainfall for the ten years was 268·42 in. This was followed by a dry period continuing approximately for twenty years, from 1883 to 1902, during which there were seventeen years with a deficiency, and only three years with an excess, of rainfall. This single instance affords probably little proof for future guidance. The admirable Monthly Reports published by the Thames Conservancy and the Monthly Maps of the Thames Valley rainfall published by the Meteorological Office would afford better and more valuable data for inquiry, especially in connection with the water-supply for London.

IN a discussion on "The Use of Light as an Aid to Publicity" before the Illuminating Engineering Society on February 24 attention was directed to the indiscriminate use of bright lights in shop-windows and for illuminated signs, and the need for some form of co-ordination of such displays was emphasised. It was also remarked that the lighting of exhibitions, even those devoted to technical or scientific processes, is usually executed in a very crude manner without any scientific and organised plan. The use of light for directing attention to objects and revealing them to observers involves interesting optical problems, some of which were illustrated by a variety of luminous signs exhibited at the meeting. There was general agreement that the best effect is secured by adopting methods similar to those used in lighting the stage of a theatre, *i.e.* by concealing the actual light-sources from view. Capt. E. Stroud showed photographs of a number of shop-windows thus illuminated, and Mr. E. C. Leachman, who read a paper on illuminated signs, exhibited some striking pictorial transparency effects. A feature of these was the use of a new method of depositing colours on specially prepared linen, by the aid of which good transparency of the coloured surfaces, high luminosity, and vivid contrasts of light and shade were obtained. It was remarked that the device of illuminating a translucent picture from behind opened up new possibilities in art, as painted pictures lighted in the usual way from the front appear flat in comparison. Other forms of signs made use of ingenious colour effects. One of the most interesting devices was the sign shown by Mr. E. T. Ruthven Murray, in which light is distributed throughout the interior of a sheet of plate-glass by total internal reflection, so that white letters stencilled on the back appear strikingly illuminated, the source of light, a tubular lamp, being completely concealed from view.

THE publication of the first number of the *Antiquaries' Journal* makes a new departure in the history of the Society of Antiquaries, an attempt to bring before a wider public the results of its investigations, which have hitherto lain buried for many readers in the long series of its Proceedings and "Archæologia." The character of this the first example of the new publication ensures its success. Perhaps the most important paper is the interim report by Lt.-Col. W. Hawley on his excavations at Stonehenge conducted during the work undertaken for the preservation of the monument by H.M. Office of Works. Full details of the results of the digging required for the re-erection of some of the monoliths are given, but in the absence of a scientific commentary these may be regarded only as material for examination by experts. The most interesting new points are the excavation of the pits marked on Aubrey's map of 1606 and the statement by Dr. H. H. Thomas, Petrographer to H.M. Geological Survey, who has arrived at the important conclusion that with regard to the majority of the blue stones "their ultimate source lay in the Prescelly Mountains and in the boulder-strewn area to the immediate south-east. All possible proximate sources, however, must, of course, be investigated, but he felt that the idea of Pembrokeshire boulders being carefully selected from practically all other rocks, and stranded on the high ground of Salisbury Plain by glacial action, was contrary to all sound geological reasoning; and that such an assemblage of stones, of which so many were of the same type, pointed to human selection and conveyance from a distance."

THE Journal of the Royal Society of Arts for January 28 contains a paper by Dr. C. S. Myers on industrial fatigue. No satisfactory definition or test of industrial fatigue is known, though various suggested methods are discussed. Dr. Myers analyses the work curve, and shows that it is compounded of at least five different factors—fatigue, practice, incitement, settlement, and spurt—and in most factories probably of more. Examples from some of the publications of the Industrial Fatigue Research Board show the disadvantages of the ten-hour as against the eight-hour working day, and also the improvement resulting from suitably arranged rest-pauses. The author points out, however, that a certain amount of fatigue is not only inevitable, but also beneficial; it is when the fatigue cannot be dissipated by rest that the condition is serious and the work suffers. The difference between the work of a machine and that of a human being is emphasised; it is unnatural for the latter to maintain a uniform output hour by hour. It is also necessary for industry to recognise the importance of individual differences among workers. Dr. Myers concludes by referring to the work of the Industrial Fatigue Research Board and of the National Institute of Industrial Psychology, which latter continues and develops the more general work of the Board for special firms. Although these bodies have been working but a short time, their researches have clearly shown the very complex nature of industrial fatigue problems and the urgent necessity for scientific investigation by impartial workers.

Sixty-one pages on the growth of the antenna in termites might be thought disproportionate, but Mr. C. Fuller has made a really interesting study (Annals of the Natal Museum, vol. iv., p. 235, November, 1920). The number of segments in the antenna has, as in other insects, been held to distinguish various species, and even the length of the basal segment, numbered III., has been taken as diagnostic. But when soldiers of one species from a single colony were found with antennæ ranging from seventeen to nineteen segments, this practice clearly called for reconsideration. It now appears that the segments are produced by separation from this segment III., and normally two at a time. The two segments of a pair may fuse or the proximal element may not be separated from III., and in this way arise antennæ with an odd number of segments. The relative length of III. depends on the number of segments that have been separated from it. The variation of number is governed by a general tendency to reduction throughout the group and by various environmental factors, of which nutrition is the most important. All antennæ, even in the adults of the most fully developed species, show within segment III. unseparated segments, and are therefore arrested organs. This gradual and continuous response to the environment in a segmented organ has an obvious bearing on theories of evolution, and Mr. Fuller's paper deserves study by general biologists. Fortunately, it is well arranged and well written. But we do not like the words "quiescency" and "monolocular"; we do not understand how "acrogenous" can apply to growth in a proximal region; and we protest against the use of the anatomical term "joint" when "segment" is intended.

Messrs. Newton and Co., Ltd., 37 King Street, Covent Garden, W.C.2, have recently prepared a set of lantern-slides for a lecture on "Wireless Telegraphy" dealing more particularly with the Elwell-Poulsen system. The slides, many of which are from hitherto unpublished photographs, are accompanied by a full set of notes, which provides alternative methods of treatment for audiences of varying degrees of acquaintance with the subject.

Our Astronomical Column.

The Date of Easter.—A Bill to fix the date of Easter as the second Sunday in April has been introduced into the House of Lords by Lord Desborough. This Bill may serve to focus attention on the matter, but it is scarcely likely of itself to do more, for the question is one that calls for international and ecclesiastical co-operation, as was recognised by the Astronomical Union when it appointed Cardinal Mercier to preside over the Commission on Calendar Reform. Isolated action would only increase the present inconvenience, and obviously a Parliamentary decision would not be accepted by a considerable section of the community in such a matter as the alteration of the date of a religious festival.

Ancient Star Maps.—Dr. M. Schönfeld contributes an article to *La Nature* for February 5 on prehistoric astronomy in Scandinavia. He reproduces some old rock sketches found at Bohuslän, Venslev, and Dalby. They appear unmistakably to be intended to represent several notable star groups, Ursa Major being repeated three or four times, while Boötes, Virgo, and Cassiopeia are also more or less roughly delineated. It would appear that these designs are not *very* many thousands of years old, as several sketches of men and animals accompanying the star groups indicate that the constellations were already mapped out substantially as we now know them. The Bull, Archer, Great and Little Dog, and the ship Argo can all be traced. Moreover, Arcturus moves through 0·6° in 1000 years, and while the sketch of Boötes is too rough to assign a date to it with any accuracy, we can at least say that it is unlikely to have been drawn more than 10,000 years ago. Dr. Schönfeld claims that different sketches represent the sky at different seasons of the year, but he seems to overlook the fact that unless we know the approximate date of the drawings we may be several months in error through the effects of precession.

The 1920 Opposition of Mars.—*Popular Astronomy* for February contains very interesting drawings and photographs of Mars made at Flagstaff Observatory last spring, together with articles by E. C. Slipher and G. H. Hamilton. The aspect of Syrtis Major was very unusual, considerable sections of it being covered by a white veil, apparently cloud or mist. It was noted that this white region was not surrounded by a dark band, as was the polar cap; and it is concluded that the latter band is not illusory, as some have contended. Mr. Hamilton notes that the Syrtis appeared normal until March 8, and was then modified in two different ways. Besides the partial covering by white cloud, the south-eastern edge of the Syrtis appeared to fade and merge into the adjacent desert. Both Mr. Hamilton and Mr. Slipher refer to the veiling by mist near the limb which is a familiar feature, but at the recent opposition the mist seems to have persisted an unusually long time after sunrise.